

Stat 310, Part II, Optimization. Homework 2.

1. (Problem 3.2 Nocedal and Wright). Show that, if $0 < c_2 < c_1 < 1$, there may be no step lengths that satisfy the Wolfe conditions (3.6).
2. (Problem 3.5 Nocedal and Wright). Prove that $\|Bx\| \geq \frac{\|x\|}{\|B^{-1}\|}$ (here and everywhere else, $\|x\| = \sqrt{x^T x}$; $x \in \mathbb{R}^n$). Use this fact to establish (3.19): $\cos(\theta_k) \geq \frac{1}{M}$. Here, $\cos(\theta_k)$ is defined in (3.12) (the lecture uses minus that definition).
3. Prove that, for any positive definite matrix B we have that $(x^T Bx)(x^T B^{-1}x) \geq (x^T x)^2$, for any $x \in \mathbb{R}^n$
4. Implement the line search method where the step is obtained by the Armijo line search (Algorithm 3.1 in N&W and class) whereas the search direction is obtained by the Cholesky plus Multiple of the Identity approach (Algorithm 3.3). Apply to the Fenton function, starting at (3,2) and (3,4) and report whether you have converged and what was the order of convergence.